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Cryogenic vessels — Pressure-relief accessories for cryogenic service —

Part 1: Reclosable pressure-relief valves

Récipients cryogéniques — Dispositifs de sécurité pour le service cryogénique —
Partie 1: Soupapes de sûreté pour service cryogénique

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC *220*, *Cryogenic vessels*.

This second edition cancels and replaces the first edition (ISO 21013-1:2008), which has been technically revised.

The main changes are as follows:

— update of the terms and definitions;

— revision of cryogenic tests, in particular, the test setup.

A list of all parts in the ISO 21013 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Cryogenic vessels — Pressure-relief accessories for cryogenic service —

Part 1: Reclosable pressure-relief valves

1 Scope

This document specifies the requirements for the design, manufacture and testing of pressure relief valves for cryogenic service, i.e. for operation with cryogenic fluids below −10 °C in addition to operation at ambient temperatures from ambient to cryogenic.

This document is applicable to valves not exceeding a size of DN 150 designed to relieve single-phase vapours or gases. A valve can be specified, constructed and tested such that it is suitable for use with more than one gas or with mixtures of gases.

NOTE This document does not provide methods for determining the capacity of relief valve(s) for a particular cryogenic vessel. Such methods are provided in ISO 21013-3.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4126-1:2013, *Safety devices for protection against excessive pressure — Part 1: Safety valves*

ISO 11114-1, *Gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 1: Metallic materials*

ISO 11114-2, *Gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 2: Non-metallic materials*

ISO 15761, *Steel gate, globe and check valves for sizes DN 100 and smaller, for the petroleum and natural gas industries*

ISO 20421-1:2019, *Cryogenic vessels — Large transportable vacuum-insulated vessels — Part 1: Design, fabrication, inspection and testing*

ISO 21009-1:2008, *Cryogenic vessels — Static vacuum-insulated vessels — Part 1: Design, fabrication, inspection, and tests*

ISO 21010, *Cryogenic vessels — Gas/material compatibility*

ISO 21028-1, *Cryogenic vessels — Toughness requirements for materials at cryogenic temperature — Part 1: Temperatures below -80 degrees C*

ISO 21028-2, *Cryogenic vessels — Toughness requirements for materials at cryogenic temperature — Part 2: Temperatures between -80 degrees C and -20 degrees C*

ISO 21029-1:2018, *Cryogenic vessels — Transportable vacuum insulated vessels of not more than 1 000 litres volume — Part 1: Design, fabrication, inspection and tests*

ISO 23208, *Cryogenic vessels — Cleanliness for cryogenic service*

ASME B16.34: 2017, *Valves — Flanged, Threaded, and Welding end*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
DN
nominal size
alphanumeric designation of size for components of a pipe work system, which is used for reference purposes

Note 1 to entry: It comprises the letters DN followed by a dimensionless whole number which is indirectly related to the physical size, in millimetres, of the bore or outside diameter of the end connections.

[SOURCE: ISO 6708:1995, 2.1, modified — Moved additional information from the definition into a Note 1 to entry and deleted the previous two Notes to entry.]

3.2
pressure
gauge pressure
pressure for which the value is equal to the algebraic difference between the absolute pressure and the atmospheric pressure

3.3
rated minimum temperature
lowest temperature for which the pressure relief valve is rated by the manufacturer

3.4
category A valve
relief valve which can be expected to relieve pressure during normal operation of the cryogenic vessel

Note 1 to entry: The procedure for the seat-tightness test is described in 5.2.1.2.

3.5
category B valve
relief valve which is not expected to relieve pressure during normal operation due to the provision of an alternative relieving or control device, e.g. a pressure regulating vent valve designed for frequent operation

Note 1 to entry: The procedure for the seat-tightness test is described in 5.2.1.2.

3.6
cryogenic fluid
refrigerated liquefied gas
gas which is partially liquid because of its cold temperature

Note 1 to entry: This includes totally evaporated liquids and supercritical fluids.

3.7
PS
maximum allowable pressure
maximum pressure for which the equipment is designed as specified by the manufacturer

Note 1 to entry: Overpressure and relieving pressure are defined in ISO 4126-1.

3.8
rated pressure
PR
maximum pressure difference between the inside and outside of any pressure retaining boundary for which the boundary is designed to be operated at 20 °C

Note 1 to entry: The PR of the relief valve is the lowest PR of any component of the relief valve.

4 Requirements

4.1 General

The valve shall satisfy all the requirements of ISO 4126-1 except in the event of different requirements, where this document takes precedence.

In the context of this document, for cryogenic fluids and mixtures of them, the user shall refer to the list of cryogenic fluids in ISO 21029-1:2018, Table 1 or ISO 21009-1:2008, Table 1 or ISO 20421-1:2019, Table K.1.

4.2 Design

4.2.1 Design temperature

The valve shall be suitable for operation at all temperatures between the rated minimum temperature and +65 °C within the intended pressure range.

4.2.2 Drainage

Unless otherwise specified in the purchase order, the valve shall avoid accumulation of water within it, even when the expected outlet connection is fitted.

4.2.3 Stem guiding

The design of guiding shall avoid malfunction of the valve due to deposition and freezing of atmospheric moisture on and within the valve during normal operation. The valve shall be sufficiently robust such that the effectiveness of the guiding cannot be defeated by normal handling.

4.2.4 Inserts

Where a disc soft-insert is used to ensure leak-tight shut off, the design shall be such as to prevent cold flow of the insert to a degree that results in the valve failing to operate correctly.

4.2.5 Sublimating fluids service

Where the valve is specified as suitable for service with products that, when vented at valve operating conditions, condense from gas or vapour directly to solid, e.g. carbon dioxide (CO_2), the design shall be such as to avoid the valve failing to operate correctly due to deposition of solid product within the valve body or its outlet.

4.2.6 Electric continuity

For valves in oxidising and flammable fluids service, the maximum electrical resistance shall not exceed 1 000 Ω with no more than 28 V between the ports in order to ensure electrical continuity to prevent build-up of static electricity.